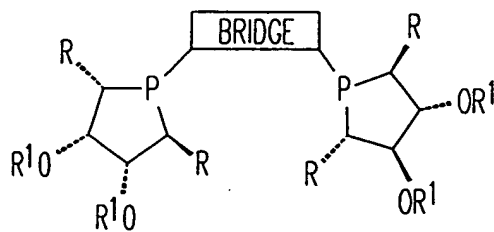
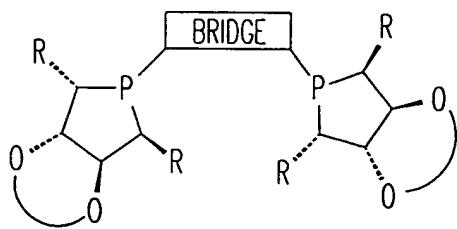


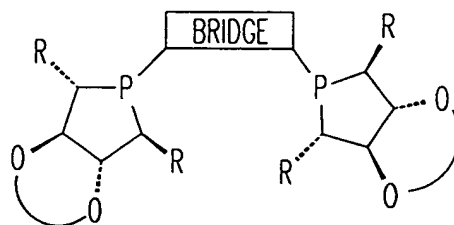
A



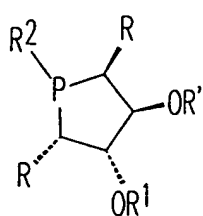
A'



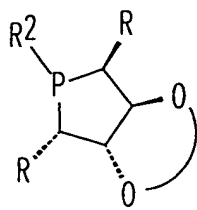
B



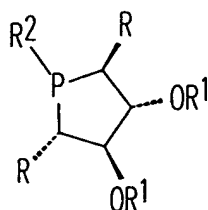
B'



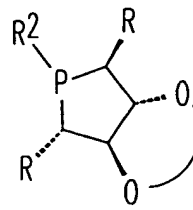
C



D

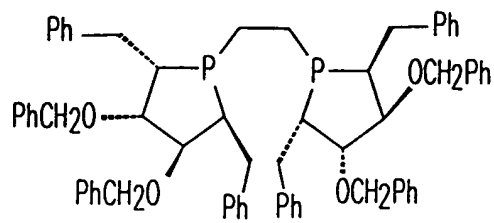


C'

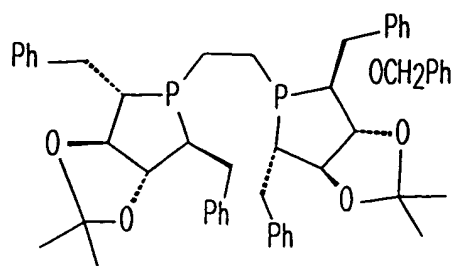


D'

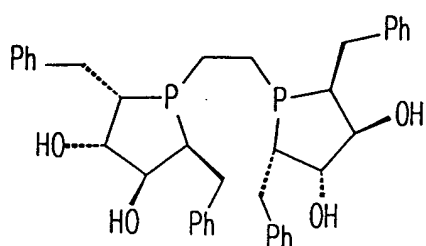
FIG. 1



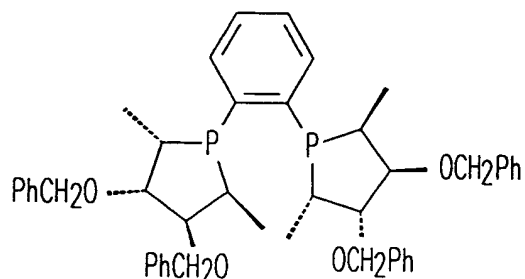
L1 (A)



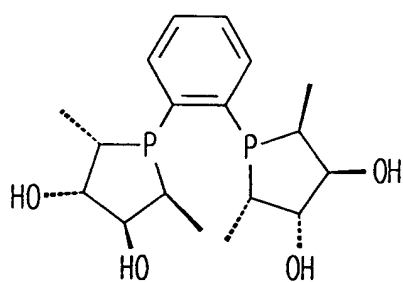
L2 (B')



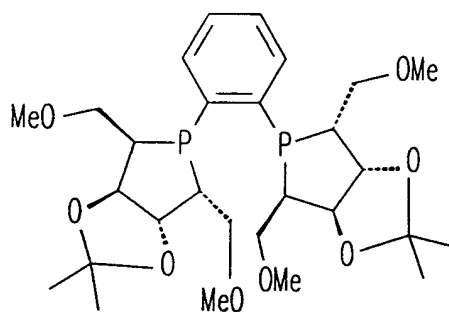
L3 (A)



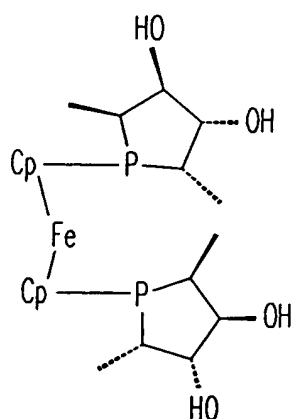
L4 (A)



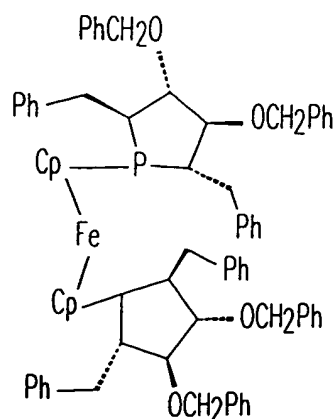
L5 (A)



L6 (B)



L7 (A)



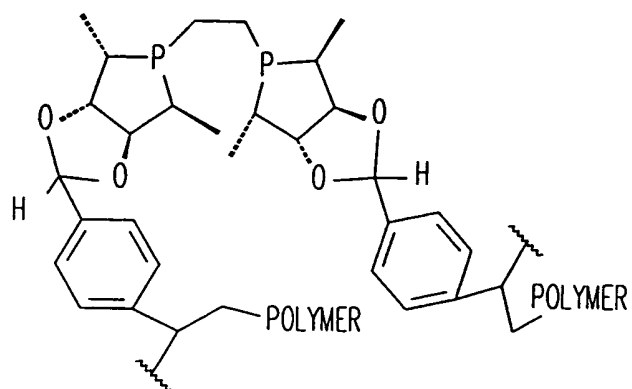
L8 (A')

FIG. 2A

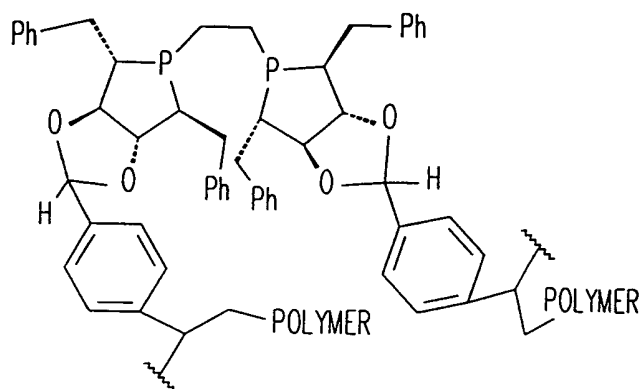
Chemical structure of a bisphosphine ligand, specifically 1,1'-bis(2,2,4,4-tetramethyl-1,3-diphenylphosphoranyl)ferrocene. The structure features two ferrocene units linked by a central ferrocene moiety. Each ferrocene unit consists of a cyclopentadienyl ring substituted with two phenyl groups and two methyl groups, and a phosphorus atom bonded to two phenyl groups.

L13 (B)

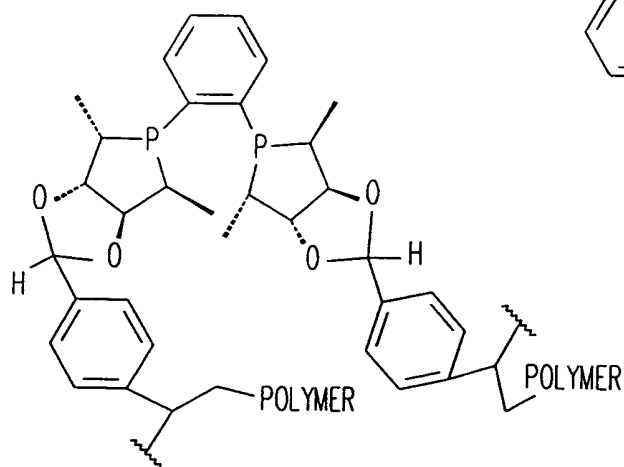
FIG. 2B



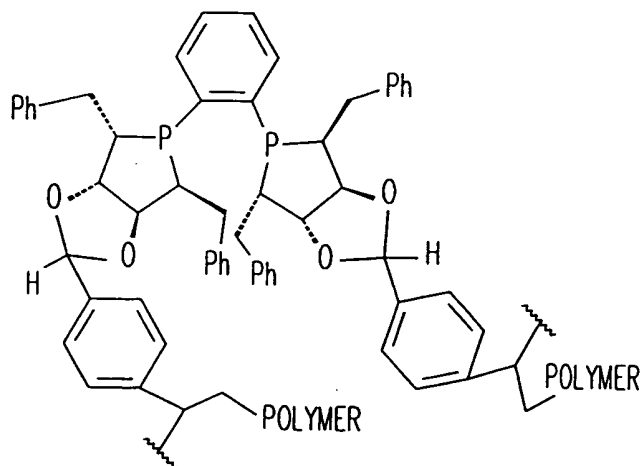
L14 (B)



L15 (B')

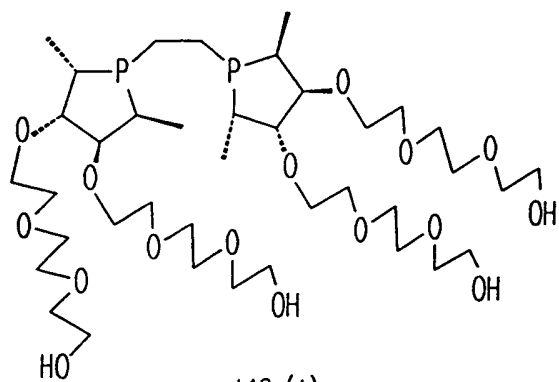


L16 (B)

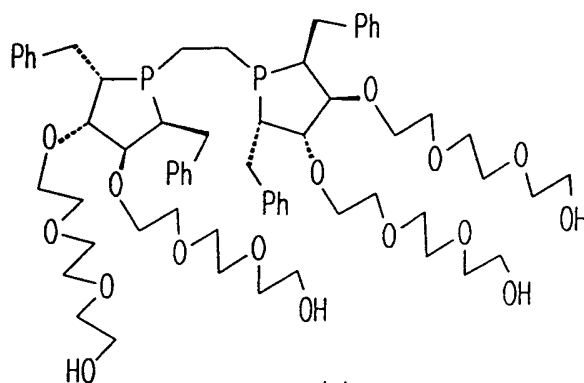


L17 (B)

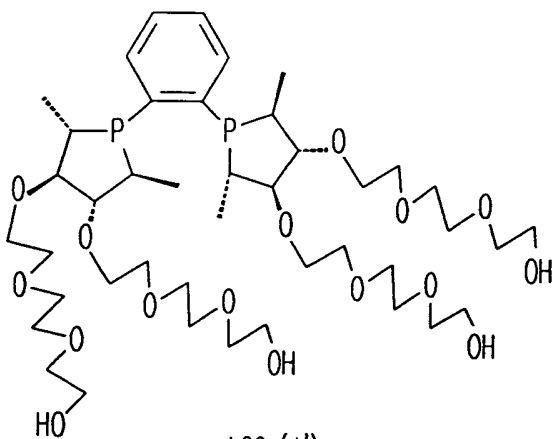
FIG. 2C



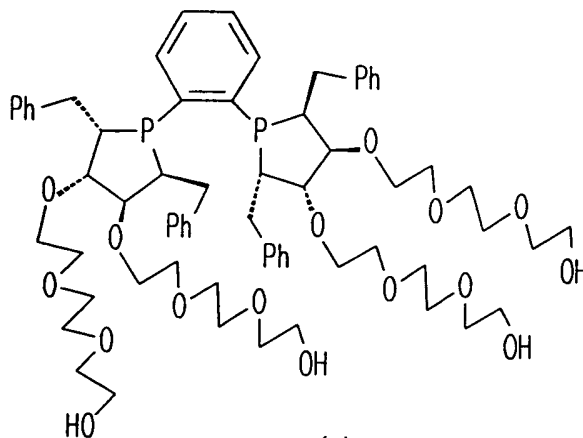
L18 (A)



L19 (A)

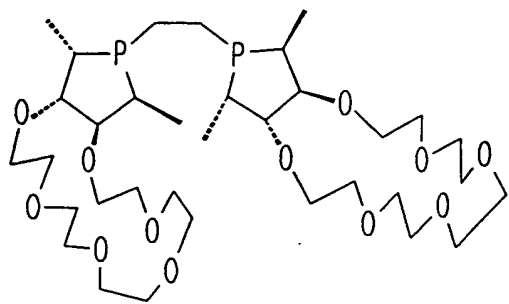


L20 (A')

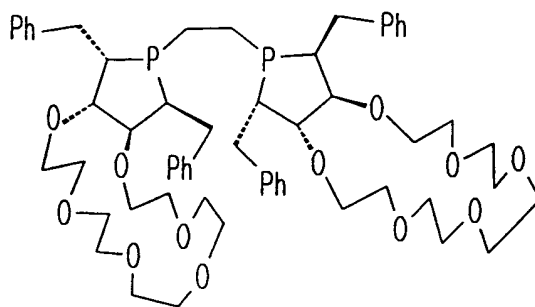


L21 (A)

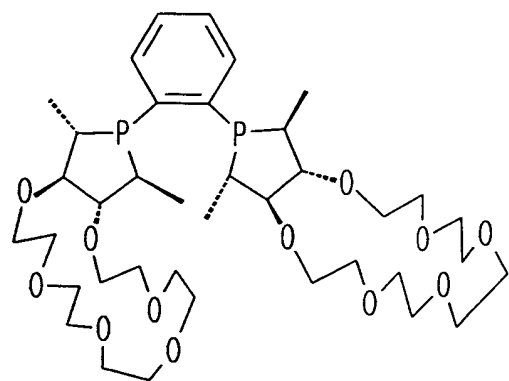
FIG. 2D



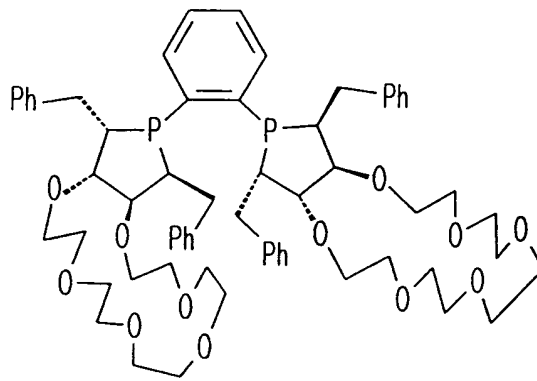
L22 (B)



L23 (B)

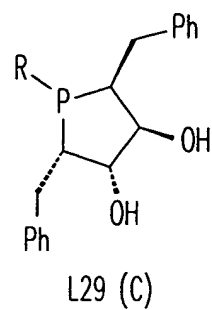
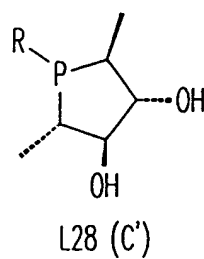
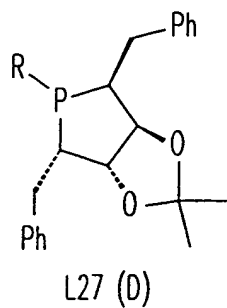
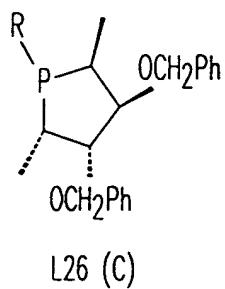


L24 (B')

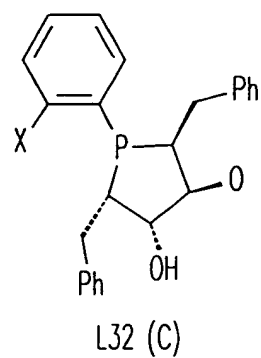
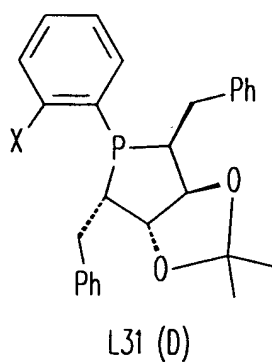
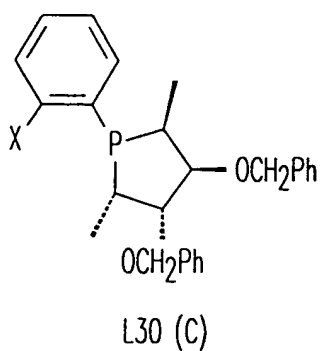


L25 (B)

FIG. 2E



R = H, Me, Et, Cy, Ph, etc.



X = CHIRAL OXAZOLINES, COOH, OMe, OH, SMe, SH, NR₂', PPh₂

FIG. 2F

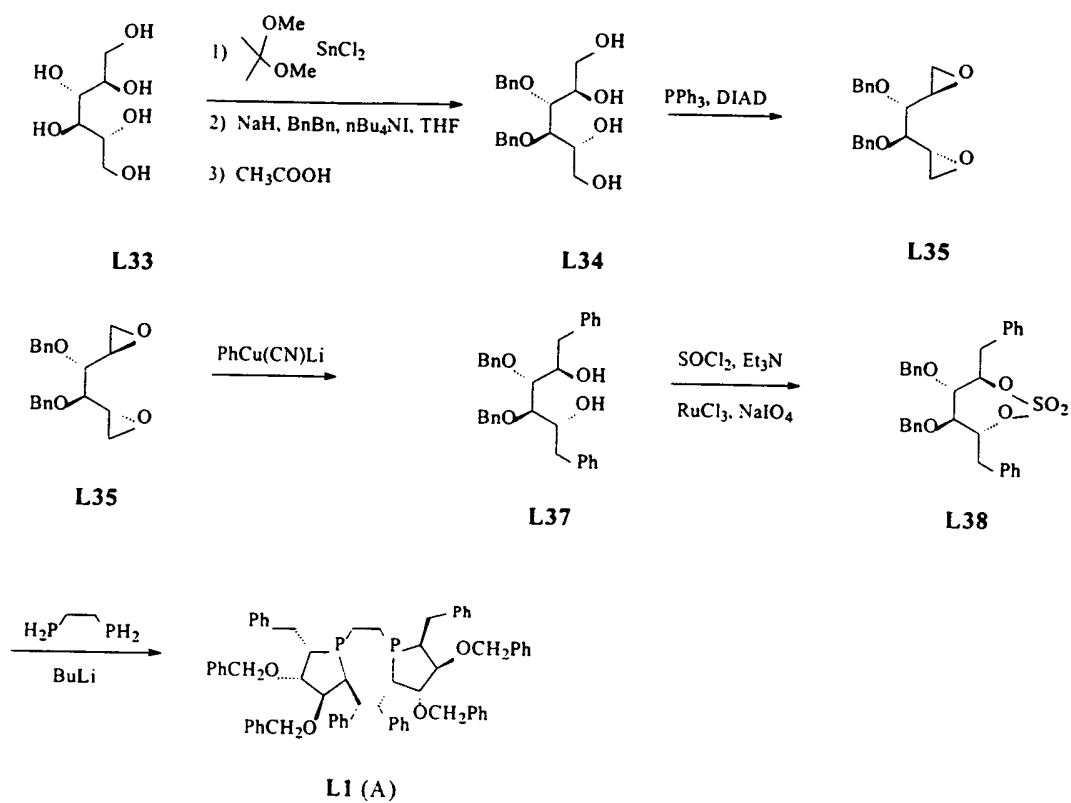


FIG. 3A

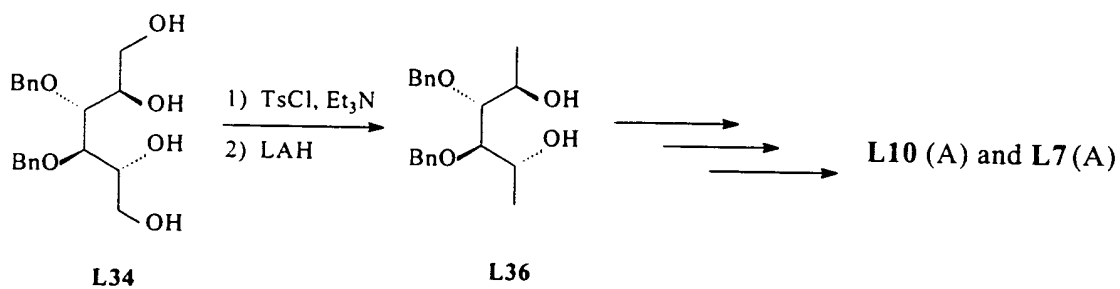
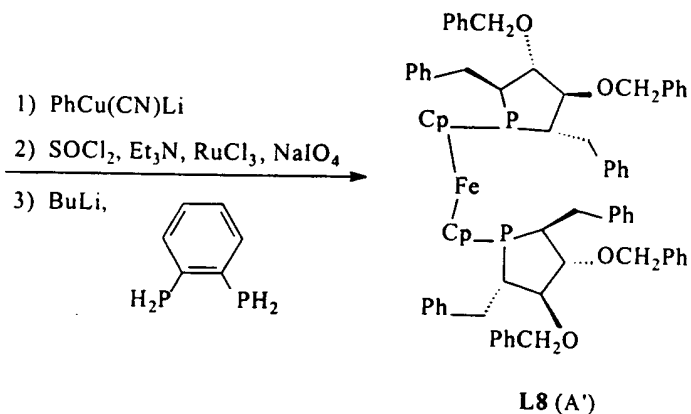
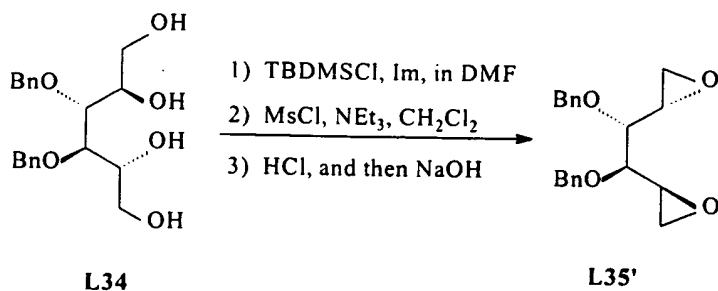


FIG. 3B

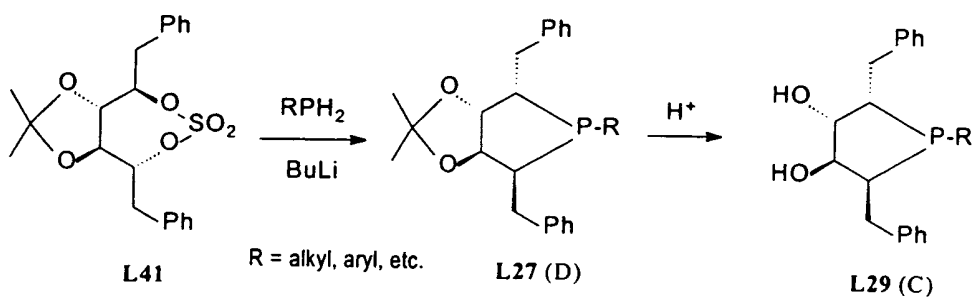
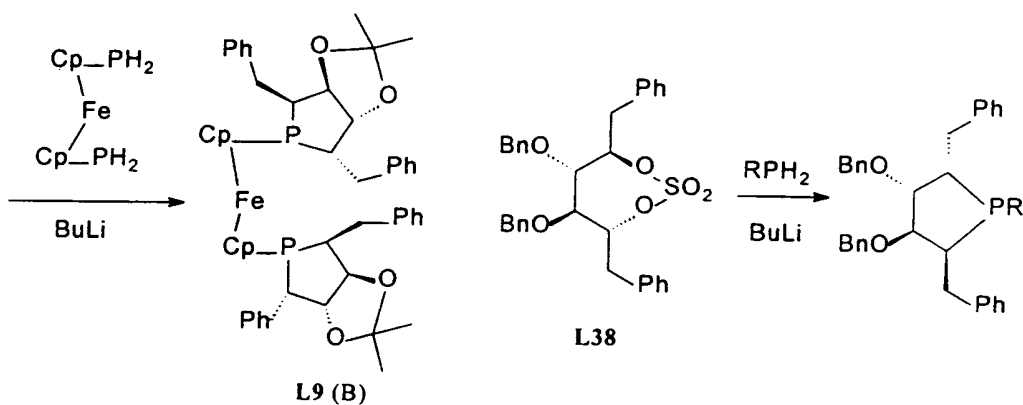
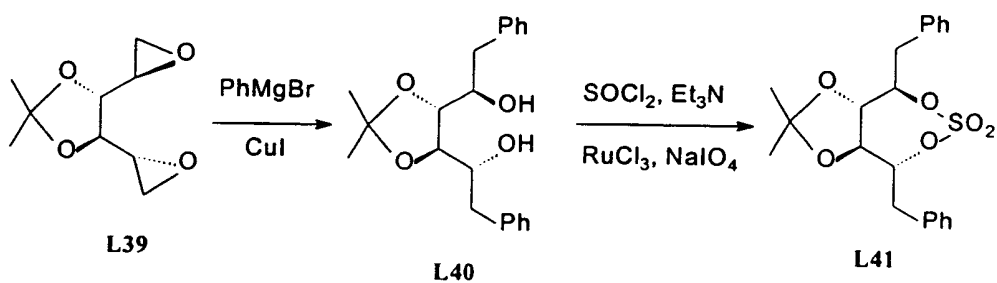
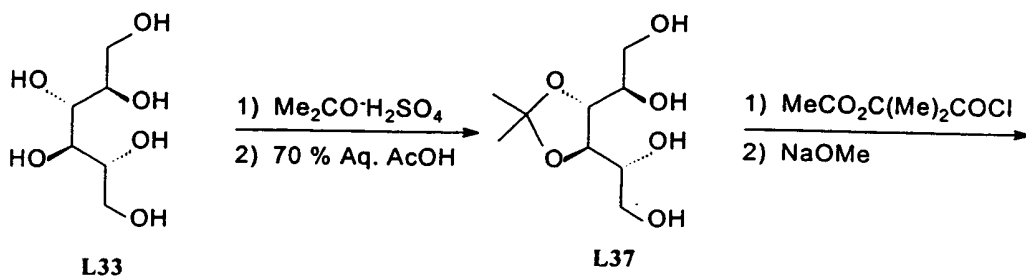


FIG. 3C

COC(=O)[C@H]1OC(C)(C)O[C@@H]1C(=O)OC
 $\xrightarrow[\text{in CH}_2\text{Cl}_2]{\text{HN(Me)OMe}\cdot\text{HCl, AlMe}_3, -10^\circ\text{C}}$
COC(=O)[C@H]1OC(C)(C)O[C@@H]1C(=O)N(C)OC

$\xrightarrow{\text{RMgX or RLi}}$
R-C(=O)[C@H]1OC(C)(C)O[C@@H]1C(=O)R
 $\xrightarrow[\text{or other [H}^+ \text{] agent}]{\text{DIBAL}}$
R[C@H](O)[C@H]1OC(C)(C)O[C@@H]1[C@H](O)R

$\xrightarrow{\text{Mitsunobo}}$
R[C@H](O)[C@H]1OC(C)(C)O[C@@H]1[C@H](O)R

FIG. 4A

Reaction scheme showing the synthesis of 1,2:5,6-di-O-isopropylidene-3,4-O-isopropylidene- α -D-glucopyranose from methyl 2,3-bis(methoxycarbonyl)-2,3-dimethylbutanedioate.

Starting material: Methyl 2,3-bis(methoxycarbonyl)-2,3-dimethylbutanedioate reacts with MeSO_2pTol and LDA, THF to form a bis-sulfonate intermediate.

The bis-sulfonate intermediate is then reduced using DIBAL to form a bis-alcohol intermediate.

The bis-alcohol intermediate is then cyclized to form the final product, 1,2:5,6-di-O-isopropylidene-3,4-O-isopropylidene- α -D-glucopyranose.

FIG. 4B

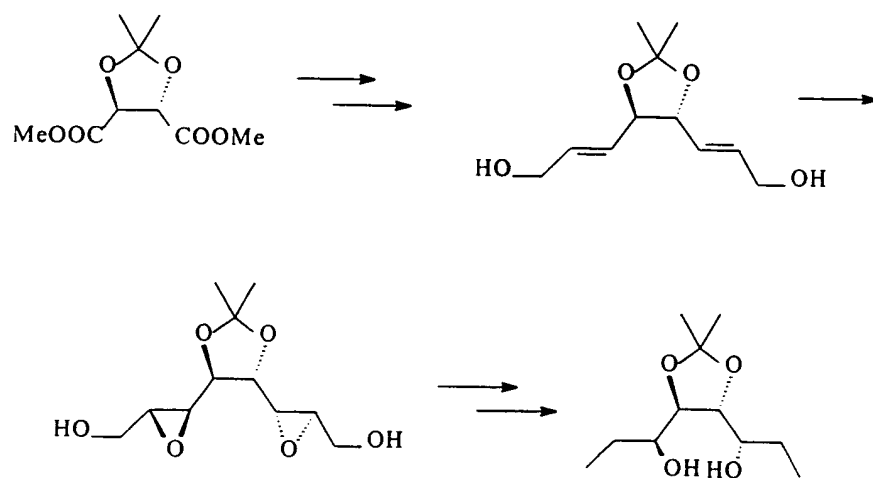


FIG. 4C